Chapter 5

Project **Evaluation**

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Project Evaluation and Assessment

5.1 Introduction

Street and Transit projects for the Connect Atlanta Plan were evaluated using a multiple step process which employed traditional and nontraditional methods. The following chapter documents steps taken to identify candidate projects for evaluation, conversion of study goals into metrics, methodologies utilized to score project metrics, and overall performance of projects. A complete list of projects and scoring results is at the end of this section. This chapter is organized as follows:

- General Overview of Analysis and Methods
- Street Project Analysis
- Transit Project Analysis
- Scoring Matrix of Street Projects
- Scoring Matrix of Transit Projects

5.2 General Overview of Analysis and Methods

Goal Development

As described in previous chapters, the development of the Connect Atlanta Plan began with a series of public outreach efforts and examination of previous studies conducted throughout the City. The following section describes activities used to develop project goals.

The inventory of previous studies described earlier, including Atlanta's Strategic Action Plan (ASAP), which is the City's Comprehensive Development Plan, were reviewed along with numerous Livable Centers Initiatives (LCI) and corridor studies. Summaries were developed to document each study's objective and to ascertain neighborhood transportation needs. Candidate projects from each study were then inventoried and analyzed to consider utility relative to community needs.

The public outreach efforts including stakeholder interviews, public meetings and Stakeholder and Technical Advisory Committees stimulated thoughts of how a future Atlanta transportation network should look and feel. From these activities a clear community vision was developed based on input from the general public, business leaders, community organizations, elected officials and other stakeholders of how the existing transportation network should evolve to meet the future needs those who live, work or play in the City of Atlanta was developed (please see Chapter 3 on public involvement as well as Appendices A and B for more detail).

Public outreach effort results and review of previous studies revealed consistent themes which were then employed throughout this plan. These efforts revealed the need to include a more complete network for pedestrians; context sensitive design to protect neighborhoods from adverse impacts of transportation projects and development; fiscal responsibility be considered for construction and future maintenance of transportation infrastructure; respect for the environment including emissions and water runoff; encouragement of exercise; a safe environment for drivers pedestrians and cyclists; a more robust bike lane network; and preparation for current and future population and employment growth areas of the city.

From these themes, the study team developed the seven goals which shaped the format and direction of the Connect Atlanta Plan, which are repeated here:

- Provide Balanced Transportation Choices
- Promote Health and Safety
- Prepare for Growth
- Maintain Fiscal Sustainability
- Create Environmental Sustainability
- Preserve Neighborhoods
- Create Desirable Places for All Citizens

Metrics Used to Measure Fulfillment of Project Goals

To measure how well projects fulfilled each community theme, a series of metrics were developed for each goal. These metrics were based on qualitative and quantitative information derived from community input, the Atlanta

Regional Commission's travel demand model and GIS spatial analysis. For a complete description of travel demand model runs, assumptions, treatment of projects and outputs, please refer to Appendix F. Some criteria developed apply to all modes while others are specific to one or more modes. Each candidate project received a score based on how it satisfied the objective of each metric.

Meeting Plan Goals

After the scoring by metric was completed, each candidate project's performance was analyzed with regard to how completely it met each goal by percentage. For example, a project that met half of the four metrics for Goal 1 would show a 50% rate for that goal. Some metrics include the possibility of a negative score; therefore, the percentage of some projects may be negative within a Goal.

Projects were then analyzed for how they performed overall. Scores for each metric were added to determine how each candidate project performed relative to one another. A sample of the scoring system is provided in Table 1.

Table 5.1: Sample Project Ranking Scoring Table

	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6	Goal 7	Score
Street Project A	67%	67%	0%	0%	0%	75%	100%	**11.00**
Street Project B	50%	100%	0%	0%	0%	75%	67%	**10.00**
Street Project C	67%	67%	0%	33%	33%	25%	67%	**9.00**
Street Project D	50%	33%	0%	0%	0%	100%	67%	**8.00**
Street Project E	100%	33%	0%	-33%	0%	75%	33%	**7.00**
Street Project F	67%	0%	67%	33%	33%	50%	-33%	**3.00**

Candidate project scores were utilized to create an overall priority rating (High, Middle and Low Tiers). This system was conceived to create a means to help citizens understand the rationale behind the performance and recommended prioritization of the projects. In this example, projects were ranked as follows:

High Priority Tier Projects
Street Project A
Street Project B

Middle Priority Tier Projects
Street Project C
Street Project D
Street Project E

Low Priority Tier Project
Street Project F

5.3 Description of Projects

More than 200 candidate street and transit projects were evaluated. This project list came primarily from four sources:

- Projects programmed in the ARC Transportation Improvement Program (TIP)
- Inclusion in the ARC Envision6 Regional Transportation Plan (RTP);
- Previous transportation projects and studies adopted by the City of Atlanta, including Livable Centers Initiative (LCI) studies, corridor studies, etc.; and
- Projects developed through interaction with community stakeholders and City staff during the Connect Atlanta Plan Design Workshops.

The list of projects evaluated included only projects that are expected to be built primarily by public agencies. Some street connections and other projects that are expected to be built by developers are included on the map book, but are not prioritized via this process. Due to their nature, some of the projects lack the quantitative attributes that lend themselves to comparative analysis of potential benefits. These include operational street improvements such as traffic signals, calming initiatives and intersection realignments, for example. Bicycle and pedestrian projects were evaluated outside of this process.

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5.4 Street Project Analysis

Overall Scoring By Project Type: Street Improvements

Over 200 street projects were evaluated. Each street project category was evaluated against projects within the category and against the overall street project list. The following project categories were utilized:

- **Bridge Upgrade** – Replacement of existing bridge structures;
- **Expressway** – Expressway access and modified connections to an interstate;
- **Intersection Capacity** – Addition of turn lanes at key intersections;
- **Intersection Realignment** – Correction of offset streets at key locations;
- **Intersection Signalization** – New or replacement of existing traffic signaling system;
- **New Streets** – Extension of existing streets that would be public projects or public contributions to street network primarily added by private development;
- **One Way Pair Conversions** – Conversion of one way streets to bi-directional traffic operation;
- **Road Diet** – Reduction in lane width, reduction in the number of traffic lanes or removal of reversible lanes;
- **Road Widening** – Increasing the number of lanes for an existing roadway;
- **Roundabout** – Construction of a traffic circle to replace grade separated bridge structure, traffic signal or stop sign.

5.5 Street Metrics by Goal

The following documents the metrics employed by goal for street related projects:

Provide Balanced Transportation Choices

S1. Modal Options

The Modal Options metric evaluated the existence of non single occupancy vehicle modes, including bicycle, transit and pedestrian components to be evaluated by direct access, proximity, and connectivity. Projects were evaluated through qualitative efforts and GIS analysis. Projects received 1 point if they connected with proposed or existing bike lane network or connected to a planned or proposed transit project.

S2. Street Congestion

Reduction of traffic congestion improves air quality by reducing automobiles idle time and reduces time spent in travel. Candidate projects were evaluated on reduced travel times from the baseline. Projects with a measured travel time reduction received a score or 1, projects that showed no reduction in travel time received a score of 0, while projects that increased travel time received a score of -1.

S3. Street Options

An effective way to reduce congestion is to provide multiple ways to accomplish the same trip. An example would be a project which crosses the BeltLine; connecting two communities in close proximity that currently have no existing connection.

This metric is a qualitative assessment of how a street project can provide new connections to the existing street network, thereby providing new ways to accomplish the same trip or connecting areas that currently have no direct connections. Candidate projects were given a score of 1 if the project provided relief to an arterial or if it provides new connections between neighborhoods. All other projects received a 0.

Promote Public Health and Safety

S4. Operational Safety

Intersections with a high number of crashes were identified throughout the study area. Often, the likelihood of accidents to occur at an intersection can be significantly reduced through proper design. Project corridors that included "critical intersections" would include designs techniques to reduce future accidents. "Critical Intersections" were identified as locations of greater than 20 accidents per year. Candidate projects with more than one "critical intersection" were given a score of 1. New streets, new expressway access projects where no accident data available and projects with less than two critical intersections were given a 0.

S5. Connectivity Measure

Streets designed for multiple modes of travel helps create better transit, pedestrian and bicycle networks. This metric promotes an integrated approach for all modes of transportation. Projects that included connections to existing and future transit and bike networks were given a score of 1. Projects not demonstrating a clear connection between modes received a score of 0.

S6. Walking and Biking Accessibility

Connections for pedestrians and bicyclists to reach parks, schools and other community facilities promotes safe opportunities for exercise, increase the number of children walking to school and the choice to complete shorter trips by means other than the automobile. Using GIS, a quarter mile buffer was drawn around community facilities (school, libraries, parks, recreation centers). Projects performing in the top third in providing connections to community facilities received a score of 1. Projects performing in the middle third received a 0 and projects in the bottom third received a
-1 score.

Prepare for Growth

S7. Project Utility

Preparing for growth includes increasing the capacity to carry higher levels of traffic in key areas. This metric utilized the travel demand model to determine future capacity of candidate projects. Capacity was measured by comparing future traffic volume from the baseline. Candidate projects that were determined to increase volume received a score of 1. A score of 0 was given to projects where no change could be determined. Projects decreasing volume received a score of -1. Candidate projects types that could not be modeled were not evaluated by this metric.

S8. Facilitate Goods Movement

Appropriate roadway design is critical to ensure trucks are able to reach local retail, industrial activity, and multimodal distribution facilities. Candidate projects along the exiting truck route network were evaluated on their ability to facilitate future truck movements. The truck network was defined as Atlanta's current designated truck route network and all routes maintained by the Georgia Department of Transportation. If a candidate project increased capacity, it received a score of 1. If a candidate project was on a truck route and reduced overall capacity or forced a difficult truck movement (ex. roundabout), it received a -1. Projects that did not affect truck capacity or did not occur on a truck route received a score of 0.

S9. Parking Facilities

Candidate projects were qualitatively assessed for their ability to create on street parking opportunities and/or do not adversely impact access to surrounding parking opportunities. Candidate projects which promoted on street parking received a score of 1. Candidate projects that did not include on street parking received a 0. Those projects which would remove existing on-street parking received a -1.

Maintain Fiscal Sustainability

S10. Unique Financing

Projects were given preference if a specific financing source was dedicated for the project. Funding could include earmarks or TAD financing. Candidate projects with identified funding received a 1 while all others received a score of 0.

S11. Return on Investment

This metric was based on a qualitative assessment of cost and value estimates. Candidate projects that showed a high ability to increase millage rates of adjoining properties were given a score of 1. All other candidate projects received a 0. This positive impact was measured based on the project's proximity to and ability to influence development in areas of future growth and redevelopment.

S12. Project Cost

The Project Cost metric was developed to analyze the unit cost of a project and its impact to the overall transportation network. Special preference was given to projects considered "low hanging fruit" such as traffic signals, intersection realignments and other intersection improvements. All projects involving improvements to an intersection were given a score of 1. All linear projects had their respective capital cost divided by the length of the project to determine a unit cost per mile. All linear projects with a unit cost per mile of $1,000,000 or less were given a score of 1. All other candidate projects received a 0. The per-mile cost of $1,000,000 was judged to be a likely threshold at which higher degrees of collaboration with regional partners would be likely, causing delays and project complications.

Create Environmental Sustainability

S13. Environmental Assessment

This metric utilized qualitative assessment of travel demand model outputs to determine a score. Change in delay by implementing the candidate project was calculated from the 2030 baseline. Note that this metric differs from Metric S7 in that it is concerned with volume and this metric is concerned with delay. If the candidate project showed a decrease in delay, it received a score of 1. If no change could be determined, it received a score of 0. If the candidate project was shown to increase delay, it received a score of -1.

S14. Water Quality

The Water Quality metric was used to identify projects that could include designs to upgrade existing storm water conditions in key areas. Using GIS and qualitative analysis, a geocoded list of key flood areas was provided by the Department of Public Works. If a candidate project included reconstruction of an area identified with flooding issues, it was assumed that the design would include strategies to manage water drainage along the corridor. Therefore, these candidate projects received a positive score of 1. If a candidate project would not address drainage (ex traffic signal project) or was not located in an area with identified water drainage issues, it received a 0.

S15. Air Quality/Project Carbon Footprint

Using output from the travel demand model, the percent change in Vehicle Miles Traveled (VMT) was determined from the 2030 baseline model to determine the ability to reduce trips. Note that this metric differs from Metric S7 in that it is concerned with volume and this metric is concerned with VMT. If a candidate project was determined to reduce trips in this scenario, it was given a score of 1, if it had no change it received a 0, and if was perceived to increase VMT, it was given a -1.

Preserve Neighborhoods

S16. Appropriateness to Context

Appropriateness to Context refers to how a proposed facility relates to current and future surrounding land use. This metric was determined through qualitative analysis using GIS spatial maps and prior knowledge of Atlanta's neighborhoods. If a candidate project was determined to enhance the surround community it received a score of 1, if neutral a 0. Negative effects were given a score of a -1.

S17. Consistency with Neighborhood Plans

Through GIS, and the inventory of corridor and LCI studies, an evaluation was conducted to determine consistency of each candidate project with the land uses and density recommendations from LCI studies. If a project came from an LCI or Corridor study or fit within study area's land use, the candidate project received a score of 1. If no study was available in the area, it received a 0. Candidate projects perceived to be in conflict with local study recommendations received a score of -1.

S18. Percent Complete Streets
The existence of non single occupancy vehicle modes, including bicycle, transit and pedestrian components was seen as an important candidate project element. If a project included a reduction of actual speeds, or the presence of bike lanes was identified the project received a 1. All other projects received a 0. Due to no availability of sidewalk data, this component of streets could not be measured. Transit projects were measured under separate criteria discussed later in this chapter.

S19. Historic Preservation
An analysis was conducted to measure the ffect on potential historic structures by candidate projects. Candidate projects were given a score of 1 if there were no identified historic structures affected, a score of 0 if there was one and a 1 if more than one historic structure was affected.

Create Desirable Places for All Citizens

S20. Quality of Public Realm
A qualitative evaluation was completed to identify projects that to some extent improved or created public space and/or promotes the vitality of an activity center based on a review of surrounding land uses and transportation network. Projects that were deemed to enhance public space were given a score of 1, while all other projects received a score of 0.

S21. Community Preference
Community Preference was a qualitative assessment of projects that have been openly opposed or supported by the public either via project specific venues (i.e. workshops or public meetings) and /or City council meetings. Candidate projects openly supported received a score of 1, 0 if no community voiced preference and -1 for those projects publicly opposed.

S22. Parks and Community Facilities Accessibility
In the theme to improve connections, candidate projects received preference if they provided direct access to community facilities through non single occupancy vehicles. Candidate projects that included a bicycle element within ¼ mile of a community facility received a score of 1, while those that did not received a score of 0.

Table 5.2: Street Network Project Types Descriptions

Project Type	Description of Street Network Coding
Roadway Widening (RW)	Capacity addition represented by increasing the number of lanes
New Street (NS)	New streets, street extensions and new street connections (mostly from redevelopment) represented by new links added to the network
Expressway Access (EX)	Connection to highway through modification or existing interchange or addition of new interchange in the model's network
One-Way Conversion (OW)	One-way conversion to two-way operation represented by adjusting one-way links to two-way with appropriate capacity modifications
Road Diet (RD)	Reduction of capacity represented by a decrease of the number of lanes in the model's network

Street Network Coding: Travel Demand Model Assumptions
The street projects under evaluation were identified as belonging to one of five major project types: Roadway Widening (RW), New Street (NS), Expressway Access (EX), One-Way Conversion (OW) and Road Diet (RD). Table 2 provides a description of each type of project. Of the more than 200 street projects scored, the travel demand process was able to analyze a total of 62 projects through the different scenarios over the course of the study.

5.6 Street Project Scoring Results by Type

The following is a description of how each street project category performed relative to other project types by Tier and how project features correlated to overall project goals and performance.

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Bridge Upgrade
These projects came from ARC's Envision 6 (Regional Transportation Plan) and performed in the middle tier. Favorable scores came through connections with the proposed bike lane network and better facilitated truck movements. This project type scored less favorably on providing new connections, increased capacity.

Expressway (EX)
Projects termed as Expressway scored in the medium and low tiers. This project category showed the most variation in design, ranging from new interchanges to reduction of off ramps and flyovers. Less favorable features were high project capital costs, discouragement of pedestrian and bike accessibility through increased road speeds and lack of appropriate context for neighborhoods.

Intersection Capacity (IC)
Intersection capacity projects typically include added turn lanes and scored in the second and third tiers. This category scored well for promoting growth and increasing capacity at key locations. This category was seen less favorable for pedestrians due to recommendations that included two or more lanes facilitating left or right turn movements.

Intersection Realignment (IR)
Intersection realignments are designed to align streets at key intersections to facilitate easier traffic movements This category typically scored well in promoting health and safety because they allow better crossing opportunities for pedestrians, promote balanced transportation choices, reduce congestion, help facilitate better truck movements through intersections, address safety issues and the associated reduction in accidents and offer an opportunity to address flooding issues at key intersections during construction. Intersection Realignment projects tended to perform in the high and middle tiers.

New Streets (NS)
New Streets received the highest scores, particularly projects involving the Beltline. These projects scored well because of their ability to connect with proposed transit improvements, proximity to the proposed bike network and the ability to provide new or relief connections, especially for projects connecting neighborhoods along the Beltline corridor. Due to the nature of these projects, most were evaluated on qualitative and quantitative measures. New street projects tended to perform in the high and middle tiers.

One Way Pair Conversions (OW)
One Way Pair Conversions scored mainly in the medium and low tiers. This category tended to benefit from reducing average travel speeds, encouraging other modes of transportation such as walking or biking and as being more appropriate for surrounding land uses encouraged by the City and its stakeholders. However, these conversions were also seen as increasing traffic congestion and thereby reducing the corridor's ability to facilitate goods movement.

Road Diets (RD)
Road diets tended to perform in the medium tier. These projects benefited from their ability to encourage non single occupancy vehicle travel because of their component for sidewalks and bike lanes. Road diets were also seen as providing more opportunities for public space through the reduction of existing street lanes. However, these projects were often penalized for increased congestion and the narrowing of right of way along designated truck routes. They were also often envisioned as conversions of four-lane undivided roadways to three lanes (two travel lanes with a center two-way left turn lane), though the travel demand model was unable the capacity benefits of this kind of facility.

Road Widening (RW)
Road Widening projects scored mostly in the medium and low tiers. In general, these projects experienced positive scores by reducing the Travel Time Index (TTI) and increasing capacity. Although widenings increase capacity and provide better flow of traffic, these projects received less favorable scores due to increases in vehicle miles traveled (VMT), increased vehicle emissions and the need acquire right of way, which tended to negatively impact existing neighborhoods and increase project costs.

Roundabouts (RB)
Roundabouts scored primarily in the high and medium tier. Favorable attributes include reducing automobile speeds, encouraging pedestrian and bicycle travel, improved air quality by reducing the acceleration need from that of a signalized or 4 way stop for cars and the opportunity to provide improved drainage at key flood locations identified by the city. Roundabouts

received less favorable scores due to their negative impact for truck traffic movements on city truck routes and state maintained streets.

Intersection Signalization (IS)
Intersection Signalization scored in the high and medium tiers. Key attributes of signalization are the promotion of safe pedestrian crossing opportunities, increased operational safety and relatively low capital costs.

5.7 Transit Project Analysis

Overall Scoring By Project Type: Transit Improvements

A total of 18 transit candidate projects were evaluated. The candidate projects were evaluated against their perceived benefit to constituents of the City through a similar process as street projects. Metrics were modified to quantify the unique attributes to transit including ridership, operating cost per rider and ability to shift trips from private auto. The following technology categories are represented in the transit project list

- **Streetcar** – Rail vehicle in mostly mixed traffic operations;
- **Bus Rapid Transit** – Projects include operations in mixed-traffic, exclusive right of way and HOV lanes;
- **Heavy Rail Transit (HRT)** – Extension of MARTA's existing Heavy Rail system in exclusive right of way;
- **Multimodal Passenger Terminal** – Transit facility designed to accommodate multiple modes of transit to be located adjacent to MARTA's Five Points Station.

5.8 Transit Metrics by Goal

The following documents the metrics employed by goal for Transit related projects:

Provide Balanced Transportation Choices

T1. Modal Options
The Modal Options metric evaluated the existence of all modes that would be included in a complete street, including roadway bicycle, pedestrian and transit. Candidate projects were evaluated through qualitative efforts and GIS analysis. A candidate project would receive a score of 1 if it connected with proposed or existing bike lane network or transit.

T2. Ability to Shift Trips from Private Auto
If a transit project was deemed to shift trips from private auto, it received a score of 1.

T3. Travel Time
The travel demand model was used to measure the change in average congested travel times compared to the baseline. Points were given to candidate projects that provided higher reductions. Candidate projects with greater than a 4% time savings received a score of 1, while those with less than 4% or could not be evaluated by the travel demand model received a score of 0.

Promote Public Health and Safety

T4. Operational Safety
Intersections with a high number of crashes were identified throughout the study area. Project corridors that included "critical intersections" were assumed to include designs to reduce future accidents. "Critical Intersections" were identified as locations of greater than 20 accidents per year. Candidate projects that could address more than 1 critical intersection were given a score of 1.

T5. Project Utility
The travel demand model was used to determine projected ridership by candidate project. Candidate projects projected to provide 6,000 or more passenger trips per day received a score of 1. Candidate projects that were projected to have between 2,000 and 5,999 trips per day or were not modeled received a score of 0. Candidate projects with less than 2,000 trips per day received a sore of -1.

T6. Walking and Biking Accessibility
Connections for pedestrians and bicyclists to reach parks, schools and other

community facilities promotes safe opportunities for exercise, children walking to school and the choice to complete shorter trips by means other than the automobile. Using GIS, a quarter mile buffer was drawn around community facilities (school, libraries, parks, recreation centers). Candidate projects performing in the top third in providing connections to community facilities received a score of 1. Candidate projects performing in the middle third received a 0 and projects in the bottom third received a -1 score.

T7. Support of Development Goals
The Connect Atlanta Plan used a number of previous studies to gauge transit improvement recommendations and needs. If a candidate project utilized a corridor recommended for transit improvement from a previous study, it received a score of 1. Candidate projects located in corridors not recommended for transit improvements from a previous study received a score of 0.

Prepare for Growth

T8. Future Density vs. Transit Service
The change in density was measured between the 2005 base year and 2030 using GIS analysis. Locations with the projected highest densities were deemed to have the most need for transit improvements. Candidate transit projects that served areas identified to have the highest level of density in 2030 received a score of 1. Candidate projects that did not serve areas projected to have the highest level of density received a score of 0.

T9. Viability of Transit Implementation
Using GIS analysis, candidate projects were analyzed for their viability of being built. Candidate projects using existing right of way (ROW) received a score of 1. If candidate projects were identified as having a moderate impact on ROW, it received a 0. Candidate projects requiring dedicated ROW received a -1.

Maintain Fiscal Sustainability

T10. Unique Financing
Candidate projects were given preference if a specific financing source was dedicated for the project. Funding could include earmarks or tax allocation district (TAD) financing. Candidate projects with identified funding received a 1 while all others received a score of 0.

T11. Return on Investment
This metric was based on a quantitative assessment of cost per passenger. The top third of candidate projects with the lowest cost per trip received a score of 1. The middle third of candidate projects received a sore of 0, while the lower third received a -1.

T12. Operations/Maintenance
The Project Cost metric was developed to analyze 2007 quantified annual operating and maintenance costs per technology and cost per rider. Candidate projects performing in the top third with lowest operating cost per passenger received a 1, candidate projects in the middle third received a 0, while candidate projects with the highest cost per rider received a score of -1.

T13. Infrastructure Utilization
Through the travel demand model ridership output, a qualitative analysis was done to assess ridership increases on the existing MARTA transit system by candidate projects. If a project had a positive effect on the existing transit network, it received a score of 1; all others received a score of 0.

Create Environmental Sustainability

T14. Environmental/Brownfield Sites
This metric utilized both quantitative and qualitative measures to arrive at a score. The GIS database was used to determine if a project would encounter significant environmental or brownfield sites. It is assumed the cleanup of such sites will add time and cost to the project, so any project encounterinng these sites recieved -1 point. It should be noted that it appears the database of environmental and brownfield sites is more complete in some parts of the City than others. As this database is expanded, more transit candidates may be found to encounter these sites.

T15. Air Quality
The travel demand model reuslts were used to determine if the project helped to reduce VMT and would, therefore, be likely to have an air quality benefit. If so, it was given 1 point. A project that negatively affected air quality was given -1 point.

Preserve Neighborhoods

T16. Appropriateness to Context
This qualitative assessment considered the type of facility being proposed and its relation to projected future surrounding land use improvements. If the candidate project design complemented future land use, it received a score of 1, 0 if neutral or -1 if it opposed future land use. This inclusion was based on a combination of inclusion in prior plans, public feedback and professional judgment.

T17. Consistency with Neighborhood Plans
Through GIS, and the inventory of corridor and LCI studies, an evaluation was conducted to determine consistency of each candidate project with the land uses and density recommendations from LCI studies. If a project came from an LCI or Corridor study or fit within study area's land use, the candidate project received a score of 1. If no study was available in the area, it received a 0. If the project was against local study recommendations, it received a -1.

T18. Percent Complete Streets
The existence of non single occupancy vehicle modes, including bicycle, transit and pedestrian components was seen as an important candidate project element. If a candidate project provided additional connectivity to other modes, it received a score of 1. All other candidate projects received a score of 0.

Create Desirable Places for All Citizens

T19. Quality of Public Realm
A qualitative evaluation was completed to identify projects that to some extent improved or created public space and/or promotes the vitality of an activity center based on a review of surrounding land uses and transportation network. Candidate projects that were deemed to enhance public space were given a score of 1, while all other projects received a score of 0.

T20. Community Preference
Community Preference was a qualitative assessment of projects that have been openly opposed or supported by the public either via project specific venues (i.e. workshops or public meetings) and /or City council meetings. Candidate projects supported received a score of 1, 0 if no community voiced preference and -1 for those projects publicly opposed.

T21. Parks and Community Facilities Accessibility
In the theme to improve connections, candidate projects received preference if they provided direct access to community facilities through non single occupancy vehicles. Candidate projects including a bicycle element within ¼ mile of a community facility received a score of 1, while those that did not received a score of 0.

Transit Network Coding

All 19 transit projects, including two different alternatives for a transit project based on Marietta Boulevard in northwest Atlanta, were included in the travel demand model scenario analysis. For all new transit projects, a headway equal to the current MARTA heavy rail headway (10 minutes peak, 15 minutes in off-peak) was used.

5.9 Travel Demand Model Analyses

Scenario Analyses

The project team conducted scenario-based analyses to evaluate the impact of transportation improvements and alternate land use development. Travel modeling activities performed in this phase used the version of the Atlanta Regional Commission (ARC) 20-county travel forecasting model system that was adapted to conditions in the City of Atlanta for this project.

The analysis was based on evaluating the following four model scenarios:

- Scenario 1 – the original ARC 2030 network with select study area RTP projects removed. This scenario serves as the comparative base for the scenario analysis phase of the project. The improvement scenarios analyzed were developed by adding project improvements to Scenario 1.

- Scenario 2 – includes projects focused on adding capacity to the network: specifically new roads, roadway widening projects, interchange capacity upgrades, and all recommended transit projects.
- Scenario 3 – includes projects intended to provide a balanced focus between roadway capacity and transit, specifically a limited set of new roads, one-way conversions, road diets, expressway access projects, and all recommended transit projects.
- Scenario 4 – includes projects that are primarily transit-focused, specifically a small number of new roadway projects and all recommended transit projects.

We also conducted model runs to assess the sensitivity of the results to other factors. Specifically, we evaluated the following three sensitivity scenarios:

- Scenario A Socioeconomic Sensitivity – identical to Scenario 1 with the original ARC 2030 socioeconomic files used instead of those modified for the project, used because Scenario 1 is based on modified socioeconomic data.
- Scenario B Parking Sensitivity – identical to Scenario 2 with daily parking costs within Atlanta city limits increased by $1.00.
- Scenario C Fuel Sensitivity – identical to Scenario 2 with fuel cost increased to approximately $4.00 per gallon from $1.67 per gallon.

One of the features of the ARC model is a feedback loop that inputs travel times from later model steps back into the earlier model steps that establish travel patterns. While this approach facilitates the development of more accurate travel patterns, it can introduce artificial differences when comparing between alternatives that used a different number of feedback loops. In order to maintain a consistent process across scenarios, we forced all model runs to pass through the feedback loops eight times, the maximum number of loops needed for any of the scenarios to converge.

Coding of Projects

The transportation system improvements included in the scenarios consisted of two categories of projects: street network improvements and transit projects. We analyzed a total of 62 street projects and 19 transit projects over the course of the study. This final list of evaluated projects was compiled from multiple project lists developed by the project team, including the initial ‘Comprehensive List of Projects,’ supplemental ‘LCI Projects’ and ‘Piedmont Study Projects,’ various updates with project amendments and a table of RTP projects. The RTP projects were originally coded in the ARC 2030 model network; to develop our base scenario (Scenario 1) we removed five street and two transit projects, and included them for evaluation in the scenarios. It is important to note that many RTP projects were regional or Interchange Improvement Projects within the city, and were not removed from the base scenario since their evaluation is beyond the scope of this project.

Street Network Coding

The street projects under evaluation were identified as belonging to one of five major project types: Roadway Widening (RW), New Street (NS), Expressway Access (EX), One-Way Conversion (OW) and Road Diet (RD). Table 2 on page 6 provides a description of each type of project. Projects that were defined in previous studies were identified separately as Previous Study (PS).

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The project team analyzed a total of 62 street projects through the different scenarios over the course of the study. Table 5.3 (which continues onto page 13) lists these projects and the scenarios in which they were included.

Table 5.3: List of Street Project with Included Scenarios

Project ID	Street Project Type	Street Project Name	Scenario 1	Scenario 2	Scenario 3	Scenario 4
RW-003	Roadway Widening	Campbellton Road	N	Y	N	N
RW-004	Roadway Widening	Cleveland Avenue	N	Y	N	N
NS-001	New Street	15th Street	N	Y	Y	Y
NS-002	New Street	Deering Street Extension Part 1	N	Y	Y	Y
NS-006	New Street	North Avenue Reconnection	N	Y	Y	Y
NS-013	New Street	Sylvan Road Extension	N	Y	Y	Y
NS-014	New Street	Extend University Avenue to Avon	N	Y	Y	Y
NS-016	New Street	Ridge Avenue to Boulevard Connection	N	Y	Y	Y
NS-044	New Street	New Street Connection	N	Y	Y	Y
NS-045	New Street	Watts Road Extension to Hollywood Road/Gun Club Road	N	Y	Y	Y
NS-047	New Street	New Street Connection	N	Y	Y	Y
NS-052	New Street	Buford Highway Interchange	N	Y	Y	Y
NS-055	New Street	Extension of New Peachtree Parkway	N	Y	Y	Y
NS-080	Expressway Access	Spring Connection at Ivan Allen Plaza	N	N	Y	N
OW-001	One-Way Conversion	Ponce De Leon	N	N	Y	N
OW-010	One-Way Conversion	Piedmont & Juniper Streets Phase 1	N	N	Y	N
OW-011	One-Way Conversion	Piedmont & Juniper/Courtland Streets Phase 2	N	N	Y	N
OW-012	One-Way Conversion	Spring Street & West Peachtree	N	N	Y	N
OW-013	One-Way Conversion	Centennial Olympic Park Drive & Spring Street	N	N	Y	N
OW-014	One-Way Conversion	Andrew Young International Blvd. and Ellis Street	N	N	Y	N
OW-015	One-Way Conversion	Martin Luther King Blvd. and Mitchell Street	N	N	Y	N
OW-016	One-Way Conversion	Baker Street and Harris Street	N	N	Y	N
OW-019	One-Way Conversion	Hill Street	N	N	Y	N
OW-021	One-Way Conversion	Atlanta Avenue	N	N	Y	N
RC-002	Road Diet	Northside Drive Removal of Reversible Lanes	N	N	Y	N
RC-003	Road Diet	Northside Drive Road Diet	N	N	Y	N
RC-004	Road Diet	Northside Parkway Road Diet	N	N	Y	N

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Project ID	Street Project Type	Street Project Name	Scenario			
			1	2	3	4
RC-008	Road Diet	Martin Luther King Road Diet	N	N	Y	N
RC-011	Road Diet	Boulevard Road Diet	N	N	Y	N
RC-012	Road Diet	North Avenue Road Diet	N	N	Y	N
RC-013	Road Diet	Langhorn Street Road Diet	N	N	Y	N
RA-002-03	Road Diet	Bolton Road Diet	N	N	Y	N
EX-001	Expressway Access	Buford Highway Connector/ Peachtree	N	N	Y	N
EX-002	Expressway Access	Williams-Spring Ramp System	N	N	Y	N
EX-003	Expressway Access	Courtland Street Ramp	N	N	Y	N
EX-004	Expressway Access	Freedom Parkway Ramps	N	N	Y	N
EX-005	Expressway Access	I-285 and Langford Parkway interchange reconfiguration	N	N	Y	N
PS-RW-005	Roadway Widening	Northside Drive Widening	N	Y	N	N
PS-RW-006	Roadway Widening	Northside Drive Widening	N	Y	N	N
PS-NS-014	New Street	Avon Extension	N	Y	Y	Y
PS-NS-016	New Street	Alabma Street Extenstion	N	Y	Y	Y
PS-NS-022	New Street	Trabert Street Extension	N	Y	Y	Y
PS-OW-001	One-Way Conversion	Trenholm Street	N	N	Y	N
PS-OW-002	One-Way Conversion	Hills Avenue	N	N	Y	N
PS-OW-003	One-Way Conversion	Baker/Harris 2 Way Conversion	N	N	Y	N
PS-RD-001	Road Diet	Boulevard Three-Lane Conversion	N	N	Y	N
PS-RD-002	Road Diet	Cheshire Bridge Redesign	N	N	Y	N
PS-RD-003	Road Diet	Memorial Drive Rebuild	N	N	Y	N
PS-RW-100	Roadway Widening	Piedmont Road Capacity Improvement 1	N	Y	N	N
PS-OP-101	Street	Piedmont Road Capacity Improvement 2	N	Y	N	N
PS-RD-100	New Street	Lindbergh Drive Consolidation	N	Y	N	N
PS-EX-004	Expressway Access	I-85/Lindbergh Drive HOV Ramps	N	Y	N	N
RTP-RW-009	Roadway Widening	Us 41 (Northside Parkway)	N	Y	N	N
RTP-RW-010	Roadway Widening	Sr 154/166 (Campbellton Road)	N	Y	N	N
RTP-RW-013	Roadway Widening	Southside Industrial Parkway	N	Y	N	N
RTP-RW-014	Roadway Widening	University Avenue	N	Y	N	N
RTP-RW-012	Roadway Widening	Stone Hogan Drive Extension	N	Y	N	N

Chapter 5

Transit Network Coding

We evaluated 19 transit projects in the scenario analysis, as listed in Table 5.4 (which continues onto page 15). TR-006 had two different iterations and both are described in Table 5.4. Only the two transit RTP projects - Downtown East-West Streetcar and Piedmont / Roswell Road Transit - were included in the base scenario, while all transit projects were included in Scenarios 2-4. For all new transit projects, a headway equal to the current MARTA heavy rail headway (10 min peak, 15 min in off peak) was used.

Table 5.4: Transit Project Description

Transit Project ID	Transit Project Type	Project Name	Description
TR-001	Fixed Guideway	BeltLine Transit	22-miles of new alignment Light Rail Transit / Streetcar - The BeltLine
TR-002	Fixed Guideway	MARTA West Line Extension	1.2 mile at-grade extension of MARTA's west line on new alignment with two bridge structures.
TR-003	Fixed Guideway	MARTA West Line Bus Rapid Transit	3.4 mile (in the City of Atlanta) Bus Rapid Transit extension of MARTA's west line on new high-occupancy vehicle lanes in I-20 with transit stations at Martin Luther King and Fulton Industrial Blvd..
TR-004	Fixed Guideway	I-75 Express Bus	8.0 mile (in the City of Atlanta) Enhanced Express bus on modified high-occupancy vehicle lanes in I-75 with transit stations West Paces Ferry, Atlantic Station, and MARTA's Arts Center Station.
TR-005	Fixed Guideway	I-85 Express Bus	4.7 mile (in the City of Atlanta) Enhanced Express bus on modified high-occupancy vehicle lanes in I-85 with transit stations MARTA's Midtown Station.
TR-006 **A** and **B**	Fixed Guideway	Northwest Regional Light Rail Transit Corridor: (**A**) Marietta Boulevard / North Avenue LRT and (**B**) Marietta Boulevard / Chattahoochee Road LRT	**A:** Light Rail Transit on new exclusive alignment in shared right-of-way from Cobb County to Ga. Tech and the Coca Cola Headquarters, via Marietta Blvd. to Marietta Street to 8th Street to Tech Parkway to Luckie Street, turning at North Avenue and continuing on North and Ponce de Leon to City Hall East. **B:** Same alignment from Cobb County, but transit turns eastward on Chattahoochee Road and continues via CSX rail alignment to BeltLine, terminating at Lindbergh Center rail station.
TR-007	Fixed Guideway	Peachtree Streetcar (Buckhead to Midtown segment)	5.8 miles of streetcar operating in mixed traffic in the outside travel lane. Peachtree Road will be widened from 6-lane undivided to 6-lanes divided with center left-turn lane.
TR-008	Fixed Guideway	Peachtree Streetcar (Midtown-Downtown segment)	2.85 miles of streetcar operating in mixed traffic in the outside travel lane. No reconstruction of Peachtree Street is anticipated in this section.
TR-009	Fixed Guideway	Peachtree Streetcar (Downtown - Fort McPherson segment)	4.9 miles of Streetcar operating in mixed traffic in the outside lane with limited reconstruction of Trinity, Peters and Lee Street is anticipated in this section.

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Transit Project ID	Transit Project Type	Project Name	Description
TR-010	Fixed Guideway	Campbelton Road Streetcar (Fort McPherson to Greenbrier Mall	5.5 miles of Streetcar operating in mixed traffic in the outside lane with limited reconstruction of Campbelton Road.
TR-011	Streetcar	Downtown East-West Streetcar	2.5 mile Streetcar operating in mixed traffic in the outside lane looping outside lane with limited reconstruction of Peachtree Street, Auburn Avenue, Edgewood Avenue, Glen Iris Avenue, Baker Street, Thurmond Street, Marietta Street, and Centennial Olympi
TR-012	Streetcar	Capital Avenue & Prior Street Street Car	4.6 mile Streetcar operating in mixed traffic in the outside lane with limited reconstruction of Capital Avenue, Ralph David Abernathy, and Prior Street.
TR-013	Bus	Piedmont / Roswell Road Transit	4.3 miles of high frequency bus transit (10-minute headways with appropriate physical pedestrian streetscape improvements and permanent transit amenities along Roswell Road and Piedmont Road.
TR-014	Bus	Moreland Avenue Transit	6.4 miles of high frequency bus transit (10-minute headways) with appropriate physical pedestrian streetscape improvements and permanent transit amenities along Moreland Avenue.
TR-015	Streetcar	Donald Lee Hollowell Parkway Transit	8.3 miles (within City of Atlanta) of high frequency bus transit (10-minute headways) with appropriate physical pedestrian streetscape improvements and permanent transit amenities along Donald Lee Hollowell Parkway, Tech Parkway, and North Avenue.
TR-016	Streetcar	MARTA Streetcar Extension to West Highlands	2.5 miles of Streetcar operating in mixed traffic in the outside lane on a newly extended Grove Park Place.
TR-017	Streetcar	Boulevard Streetcar	1.25 mile Streetcar operating in mixed traffic in the outside lane with appropriate physical pedestrian streetscape improvements and permanent transit amenities along Boulevard between Auburn Avenue and Ponce De Leon Blvd.
PS-TR-001	Streetcar	Streetcar	(LCI studies) Along RDA from West End MARTA to Grant Park

Chapter 5

Performance Measures of Effectiveness

To gauge the transportation system performance, measures of effectiveness (MOEs) were computed at the levels of individual corridors/transit routes in the City of Atlanta (Study Area) and the Atlanta metropolitan region as a whole. While the specific MOEs used to evaluate the performance may differ at the different geographic levels, the basic performance measures were computed from outputs of the enhanced Atlanta model. Except for those that are transit-specific, all study area-level MOEs are calculated using only network links located within the study area. Further information on transit-specific performance measures is included with the descriptions below.
At the regional and city levels, the performance of the transportation system was evaluated with a set of MOEs that included the following:

- Vehicle Hours of Travel (VHT) – used as an indication of system travel efficiency and level of congestion.
- Regional Travel Time Index (TTI) – the ratio of forecasted travel times (including congestion) to free-flow travel times. The ARC has designated TTI as one of its preferred MOEs.
- Annual Congestion Cost and Daily Delay Hours – measures of travel that indicate the degree of congestion present. Daily Delay indicates the amount of congestion in hours while Annual Congestion Cost converts the delay into monetary units. Because TTI (described above) is the ratio of congested travel time to free-flow travel time, Daily Delay can be thought of as a building block of TTI since it indicates the difference between congested and free-flow travel times.
- Annual Congestion Cost per Person – the total annual congestion cost divided by total population.
- Vehicle Miles of Travel (VMT) – used as a measure of utilization of roadway system denoting the level of travel consumption.
- Mode Split – the percentage of total person-trips made using public transit. In the calculation of this MOE, a trip is considered to be a study area trip if one or both of its ends are within the study area.
- Total Unlinked Transit Trips – the total number of transit boardings. A transit trip involving a single transfer counts as two unlinked trips. For the study area, this calculation includes all trips on transit routes that operate in or pass through the study area.
- Mode Split for Home-based Work Trips (at study area-level only): the percentage of total home-based work person-trips made using public transit. In this case, a trip is considered to be a study area trip only if its origin is within the study area.

In order to evaluate the impact of a project on the specific corridor in which it is located, we defined and computed a number of corridor performance measures. The calculation of street corridor performance measures required the identification of all street network links contained in each corridor. Once all links belonging to each corridor were identified, we generated the following performance measures:

- PM peak period VC ratio – used to provide an indication of the level of service during the peak travel period. VC ratios for each link were combined together using a weighted average of VMT.
- PM peak period average volume – indicates the usage level of a corridor during the peak period, and is particularly beneficial in identifying when a scenario results in more or less corridor use. It is calculated by dividing the total corridor PM peak period VMT by the total corridor length.
- Daily average volume – indicates the usage level of a corridor throughout the day, and is a useful measure to indicate when a scenario results in more or less corridor use. It is calculated by dividing the total corridor VMT by the total corridor length.
- Daily Delay – a measure of travel under congested conditions, indicating the degree of congestion and a component of TTI (itself a ratio of congested to free-flow travel times).
- Travel Time Index – a comparison between the forecasted travel conditions and free-flow conditions. The ARC has designated TTI as one of its preferred measures of effectiveness, and therefore we review it at the corridor level in addition to at the county and regional levels. An increase in a corridor TTI does not necessarily indicate poor performance of a corridor project, since some improvements may improve free-flow travel speeds and attract more traffic, which may result in more delay and a higher TTI. Such a situation highlights the "network effects" of a transportation project, where corridor performance may appear worse but performance at the county or regional level may be improved due to the project.
- PM peak period average speed – used to indicate the average speed of travel during the peak period. The average speed is

calculated by dividing the total corridor VMT by total corridor VHT for the PM peak period.
- Daily average speed – used to indicate the average speed of travel over the course of the day. The average speed is calculated by dividing the total daily corridor VMT by total daily corridor VHT.
- PM peak period corridor travel time – represents the average travel time of the entire corridor during the PM peak period.
- Daily corridor travel time – represents the average daily travel time of the entire corridor.

The above measures were calculated for the major corridors that included street projects, and the changes in these measures between each scenario and Scenario 1 were used as an indication of the performance of the individual projects.

In addition to the evaluation of street project improvements at the corridor level, we also reviewed the performance of individual transit projects by generating the following route-level performance measures:

- Boardings – the total daily passenger boardings on the route.
- Passenger Miles – the total daily passenger-miles traveled on the route.
- Passenger Hours – the total daily passenger-hours traveled on the route.
- Line Time – the average AM peak period end-to-end travel time on the route. For two-way routes, this value is the total average travel time of both directions.

5.10 Scenario Performance

Street Results

At the regional level, Scenarios 2, 3, and 4 all result in improvements over the base in nearly all categories, as displayed in Table 5.5. In terms of VHT, delay, and congestion cost, Scenarios 2 and 4 (which produced very similar regional results) were significantly more effective than Scenario 3. However, Scenario 3 does produce fewer VMT than Scenario 1, which is not surprising since Scenario 2 is more focused on expanding the street capacity while Scenario 3 takes a more balanced approach between street and transit. Each of the improvement scenarios produces more transit trips and a higher mode share of transit trips than Scenario 1. At the regional level, Scenarios 2 and 4 each provide reductions of approximately 0.6% in VHT, 1.5% in delay, 1.3% in cost of congestion, and 0.2% in VMT.

Table 5.5: Regional Performance Measures, Year 2030 Scenarios

Performance Measure	Scenario 1	Scenario 2	Scenario 3	Scenario 4
VHT (hours)	10,078,743	10,021,200	10,059,309	10,019,901
Daily delay hours	3,002,644	2,957,550	2,997,106	2,959,751
Annual congestion cost	$13,629,721,073	$13,447,789,255	$13,626,029,126	$13,457,195,193
TTI	1.61	1.60	1.61	1.60
Annual congestion cost per person	$1,970	$1,943	$1,969	$1,945
VMT	227,999,817	227,544,421	227,511,137	227,432,460
Mode Split	2.4%	2.6%	2.6%	2.6%
Unlinked transit trips	885,933	924,084	925,270	925,401

Source: CRA International analysis using ARC travel demand forecasting model

Table 5.6 displays that at the study area level, Scenarios 2 and 4 again provide significant improvement over Scenario 1, while Scenario 3 produces more VHT, more delay, higher congestion costs, and a higher TTI than the base. Scenario 2 provides the greatest reductions in VHT, delay, and congestion cost, while Scenario 4 produces the greatest reduction in VMT. Scenarios 2, 3, and 4, all produce virtually identical mode shares, both overall (11.0%) and for home-based work trips originating in the study area (23.2% to 23.3%). All three scenarios provide a significant increase in unlinked transit trips, led by Scenario 3.

Table 5.6: Study Area Performance Measures, Year 2030 Scenarios

Performance Measure	Scenario 1	Scenario 2	Scenario 3	Scenario 4
VHT (hours)	1,140,836	1,112,642	1,150,514	1,117,186
Daily delay hours	488,064	462,788	504,195	470,096
Annual congestion cost	$2,518,181,349	$2,411,416,207	$2,625,864,822	$2,448,939,939
TTI	1.92	1.87	1.96	1.89
Annual congestion cost per person	$2,665	$2,552	$2,779	$2,592
VMT	23,368,196	23,255,511	23,197,288	23,176,816
Mode Split	10.1%	11.0%	11.0%	11.0%
Unlinked transit trips	746,955	783,354	784,889	784,467
HBW mode split	20.8%	23.3%	23.2%	23.3%

Source: CRA International analysis using ARC travel demand forecasting model

While performance of Scenarios 2 and 4 are very similar at the regional level, there are some differences at the study area level. With its capacity expansion focus, Scenario 2 lowers VHT, TTI, delay, and congestion cost, while Scenario 4 and its primarily transit-focused improvements provide a greater reduction in VMT and a larger increase in transit trips. In Scenario 3, road diets and one-way conversions have cancelled out some of the performance gains created by the implementation of new roads and transit projects, resulting in more congestion than the base scenario, with only marginal increase in transit trips relative to Scenarios 2 and 4.

Performance by Project Type

As described earlier, this study analyzed the performance of many street improvement projects that fall into five categories. While we analyzed the performance of individual projects, a certain degree of caution must be used when considering performance at the project level. The ARC travel demand forecasting model is a network model, and changes in one portion of the network can impact travel conditions in other portions. To truly gauge the impact of an individual project, the model would need to be run with only that single improvement included. Such an approach is not feasible for this study which is considering 62 street projects, and different combinations of those projects.

To limit the network effects in our assessment, here we summarize the general performance of each type of street improvement by considering which types of projects were predominantly included in each scenario. Scenario 2 is comprised primarily of new streets and road widenings. As discussed earlier, Scenario 2 produces the largest reduction in TTI, indicating the shortest travel times of any scenario, which is a result one would expect for new streets and road widening projects. Scenario 3 primarily included road diets and one-way conversions. As noted earlier, Scenario 3 produced the most congestion (as exhibited by the highest TTI) although with lower total travel than the base scenario or Scenario 2 (as exhibited by VMT) and the most transit trips. These results are consistent with the a priori expectation that road diet and one-way conversion projects would lead to additional congestion due to the removal of system capacity while encouraging additional transit usage and a decrease in street travel. Expressway access projects were included as a small component of both Scenarios 2 and 3, but due to the relatively minor role of these projects in each scenario and the different performance of these scenarios, we could not isolate the impact of the expressway access projects.

Chapter 5

5.11 Sensitivity Analyses

Scenario 1: Socioeconomic Sensitivity

This sensitivity analysis was conducted to try to isolate the impact of socioeconomic modifications made for this project. As noted elsewhere in the report, the project team defined an alternate socioeconomic scenario that refocused study area and regional population and household growth into focused areas within the study area. These socioeconomic data were prepared by offsetting study area increases against decreases of population and households values in outlying counties. Such a change complicates the comparisons at the regional and study area levels. Table 5.7 shows that at the regional level the use of the ARC socioeconomic data, with its increase in population in outlying counties, produces regional increases in VHT (2.1%), delay (4.3%), congestion cost (3.3%), TTI (1.2%), and VMT (0.9%). It also has a lower use of transit (as exhibited by the mode share decrease from 2.4% to 1.8%), consistent with less population located near locations served by transit. These results differ from those at the study area level, as seen in Table 5.8, where use of the original ARC socioeconomic data with a smaller study area population results in decreases in VHT (0.6%), congestion cost (3.7%), and VMT (1.1%). Concerning transit trips in the study area, the model run with the original ARC socioeconomic data results in significantly less transit trips (change in unlinked transit trips from 746,955 to 567,375) which contributes to increases in delay (0.5%) and TTI (1.0%).

Table 5.7: Regional Performance Measures, Year 2030 Scenario 1 Sensitivity

Performance Measure	Scenario 1	Socioeconomic Sensitivity
VHT (hours)	10,078,743	10,288,907
Daily delay hours	3,002,644	3,131,062
Annual congestion cost	$13,629,721,073	$14,075,690,788
TTI	1.61	1.63
Annual congestion cost per person	$1,970	$2,065
VMT	227,999,817	230,056,718
Mode Split	2.4%	1.8%
Unlinked transit trips	885,933	692,269

Source: CRA International analysis using ARC travel demand forecasting model

Table 5.8: Study Area Performance Measures, Year 2030 Scenario 1 Sensitivity

Performance Measure	Scenario 1	Socioeconomic Sensitivity
VHT (hours)	1,140,836	1,133,732
Daily delay hours	488,064	490,639
Annual congestion cost	$2,518,181,349	$2,425,392,166
TTI	1.92	1.94
Annual congestion cost per person	$2,665	$3,354
VMT	23,368,196	23,109,331
Mode Split	10.1%	7.8%
Unlinked transit trips	746,955	567,375
HBW mode split	20.8%	17.4%

Source: CRA International analysis using ARC travel demand forecasting model

Chapter 5

Scenario 2: Parking Sensitivity

Tables 5.9 and 5.10 compare the results of Scenario 2 Parking Sensitivity and Scenario 2 at the regional and study area levels, respectively, and show that the increase in parking cost within the study area has a limited and generally counterintuitive effect at both the regional and study area levels. As expected, the increased parking cost does increase total unlinked transit trips, but rather than reducing automobile congestion through this shift to transit, there are slight increases in VHT (0.3%), delay (0.9%), congestion cost (0.9%), TTI (0.6%), and VMT (0.1%) at the regional level. At the study area level, these changes have the same sign, but are magnified. Study area changes in the major performance measures are as follows: VHT (+0.7%), delay (+1.5%), congestion cost (+1.5%), TTI (+1.1%), and VMT (+0.1%). While these changes are very small, these counterintuitive results are likely due to the way that the travel demand model's feedback loop operates. The small shift of trips from auto to transit results in fewer vehicles on the road, which results in faster travel times. During the following iteration of the feedback loop, longer trips are now more accessible due to the shorter travel times, and thus average trip lengths are increased, resulting in higher VMT and VHT values. This situation is common in regional travel demand models that use a feedback loop that passes through trip distribution.

Scenario 2: Fuel Sensitivity

Tables 5.9 and 5.10 also display the results of the Scenario 2 Fuel Sensitivity test at the regional and study area levels, respectively. These tables show that the increase in the fuel cost have the expected effect of reducing travel in the region and the study area. The increase in travel cost results in reductions in VHT (1.1%), delay (2.0%), congestion cost (1.0%), TTI (0.6%), and VMT (0.6%), while slightly increasing total unlinked transit trips. Mode split increases from 2.6% to 2.7%, while total unlinked transit trips increase by 6.0%. At the study area level, these changes are similar, with decreases in VHT (1.4%), delay (2.1%), congestion cost (0.9%), TTI (0.5%), and VMT (0.6%), while total mode split increases from 11.0% to 11.5%, and total unlinked transit trips increase by 5.6%.

Table 5.9: Regional Performance Measures, Scenario 2 Sensitivity Analysis

Performance Measure	Scenario 2	Parking Sensitivity	Fuel Sensitivity
VHT (hours)	10,021,200	10,052,884	9,909,387
Daily delay hours	2,957,550	2,982,782	2,897,424
Annual congestion cost	$13,447,789,255	$13,562,617,003	$13,319,222,082
TTI	1.60	1.61	1.59
Annual congestion cost per person	$1,943	$1,960	$1,925
VMT	227,544,421	227,741,372	226,234,837
Mode Split	2.6%	2.6%	2.7%
Unlinked transit trips	924,084	925,857	979,271

Source: CRA International analysis using ARC travel demand forecasting model

Table 5.10: Study Area Performance Measures, Scenario 2 Sensitivity Analysis

Performance Measure	Scenario 2	Parking Sensitivity	Fuel Sensitivity
VHT (hours)	1,112,642	1,120,873	1,097,219
Daily delay hours	462,788	469,713	452,985
Annual congestion cost	$2,411,416,207	$2,448,025,410	$2,389,994,301
TTI	1.87	1.89	1.86
Annual congestion cost per person	$2,552	$2,591	2,529
VMT	23,255,511	23,284,465	23,111,169
Mode Split	11.0%	11.0%	11.5%
Unlinked transit trips	783,354	784,865	827,335
HBW mode split	23.3%	23.3%	24.1%

Source: CRA International analysis using ARC travel demand forecasting model

Chapter 5

Transit Results

As discussed earlier, we included all candidate transit projects in Scenarios 2-4. Table 5.11 presents the ridership forecasts for these projects, showing little differences in these forecasts between Scenarios 2-4. The fixed guideway projects tend to have higher forecasted ridership, as these projects typically have faster travel speeds making them more attractive to travelers. Top performing fixed guideway projects include Beltline Transit, Northwest Regional Light Rail Transit, and Peachtree Streetcar.

The lack of significant difference in ridership between scenarios can be attributed in part to the assumptions made for transit service in the travel demand model.

Table 5.11: Year 2030 Ridership Forecasts for Transit Projects

Project ID	Project Name	Scenario 1	Scenario 2	Scenario 3	Scenario 4
TR-001	Beltline Transit	NA	62,892	62,808	62,915
TR-002	MARTA West Line Extension	NA	3,042	3,043	3,064
TR-003	MARTA West Line Bus Rapid Transit	NA	1,581	1,573	1,596
TR-004	I-75 Express Bus	NA	1,810	1,737	1,774
TR-005	I-85 Express Bus	NA	262	241	262
TR-006	Northwest Regional Light Rail Transit Corridor - Marietta BLVD. / North Avenue LRT	NA	25,016	25,096	25,063
TR-007 through TR-010	Peachtree Streetcar	NA	29,332	29,263	29,269
TR-011	Downtown East-West Streetcar	5,546	3,946	3,868	3,865
TR-012	Capital Avenue & Prior Street Street Car	NA	3,099	3,248	3,288
TR-013	Piedmont / Roswell Road Transit	18,491	17,712	17,636	17,658
TR-014	Moreland Avenue Transit	NA	2,772	2,771	2,768
TR-015	Donald Lee Hollowell Parkway Transit	NA	11,755	11,781	11,697
TR-016	MARTA Streetcar Extension to West Highlands	NA	9,542	9,560	9,563
TR-017	Boulevard Streetcar	NA	1,237	1,219	1,240
PS-TR-001	Streetcar	NA	1,597	1,719	1,615

Source: CRA International analysis using ARC travel demand forecasting model